REMARKS

The present invention provides a low-cost noise-cancelling optical transmission system. Electrical signals used in cellular communication are subject to interference and noise during signal transmission. Conventional optical transmission systems can produce high-quality signal transmissions by cancelling out noise and interference. However, these systems require two separate optical fibers between an optical transmitter and an optical receiver. This increases manufacturing costs, and makes conventional systems prohibitively costly for widespread commercial use.

The present invention provides the same level of noise-cancellation as conventional systems, but requires only a single optical fiber between an optical transmitter and an optical receiver. Thus, the construction cost of the present invention is lower than that of conventional systems.

The present invention includes an optical receiver with a first processing unit operable to receive an optical signal, convert a frequency of an electrical signal in the received optical signal by using intensity modulation, and then split the optical signal into two optical signals having respective intensity-modulated components with a converted frequency that are in antiphase. This structure enables the optical receiver in the optical transmission system to generate a high-quality output signal.

As can be readily appreciated from the cited art and the increasing demand for cellular communication technology, this is a relatively crowded technological field. Numerous engineers and scientists are trying to provide the most economical light monitoring equipment and to improve performance.

> "Thus when differences that may appear technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light."
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> *Continental Can Co. USA Inc. v. Monsanto Co.*, 20 U.S.P.Q. 2d. 1746, 1752 (Fed. Cir. 1991).

The Office Action contended that Claims 1-4 and 13-16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Chew et al. (US 7,260,330, hereinafter Chew) in view of Official Notice.

Chew is directed to an optical communication system which strives to achieve a high-data rate nearing theoretical performance limits. Chew relies on a correlation modulator 118 that receives a clock signal as a reference pulse and synchronizes digital signals to be optically transmitted; and a 1-bit-time-delay interferometer 122 that splits the optical signal output from the correlation modulator 118 into two optical signals and causes a 1-bit time delay.

The Office Action contended that Chew discloses converting a frequency of the received optical signal by using intensity modulation, and splitting the optical signal into two optical signals of which respective intensity-modulated components that each have the converted frequency are in antiphase.

In Chew, demodulation is performed using two optical signals, and one of the signals is delayed from the other by a 1-bit time. The noise component included in the delayed optical signal is also delayed from the noise component included in the other signal by the 1-bit time. (Column 7, Lines 50-57). Thus, even if the demodulation is performed using these two optical signals, it is impossible to cancel out the noise components, because they cannot be in antiphase due to the delay.

On the other hand, the optical receiver of the present invention includes a first processing unit 10A that generates two optical signals whose intensity-modulated components are in antiphase. The noise components are cancelled out as a result of demodulation using the two optical signals whose intensity-modulated components are in antiphase. Thus, the present invention can achieve noise-cancellation, and produce a high-quality output signal.

Specifically, the first processing unit generates two optical signals whose intensity-modulated components are in antiphase. The relative intensity noises of the semiconductor laser, included in the two optical signals, are correlated to each other since the come from the same light source, and they are in-phase after a photoelectric conversion. (Para. 0040). Since the second processing unit performs the differential amplification, an output electrical signal is generated such that the intensity-modulated components of the input electrical signals converted from the optical signals whose intensity-modulated components are in antiphase, and whose intensity-modulated frequency are in-phase. The in-phase components of the two optical signals are amplified so as to be in antiphase by the differential amplification, and accordingly, the noise components are cancelled out. (Para. 0134) The generated output electrical signal does not include the noise components included in the optical signals. Therefore, a high-quality noise-cancelled output electrical signal is obtained. (Para. 0011)

Thus, Chew does not disclose or suggest a technique to "convert a frequency of the an electrical signal in the received optical signal by using intensity modulation, and split the optical signal into two optical signals of which respective intensity-modulated components that each have the converted frequency are in antiphase", or any technique equivalent to the one performed by the first processing unit as disclosed in Claim 1.

Furthermore, the Office Action contends that Chew "comprises a correlation modulator for intensity-modulating the received optical signal." (Page 2). Chew simply discloses modulation using a correlation modulator. Intensity-modulation is a specific form of modulation in which the optical output of a source is varied in accordance with a characteristic of the modulating signal. In the present invention, the received optical signal is intensity-modulated based on a frequency of the local oscillator signal. (Para. 0141).

Chew neither discloses performing intensity-modulation, nor does it disclose having a local oscillator signal which is used to modulate an optical signal. Thus, Chew does not disclose "a first processing unit operable to receive an optical signal, convert a frequency of the received optical signal by using intensity modulation."

The Office Action acknowledged that Chew did not teach "first and second optical transmission lines which transmit the two optical signals respectively." (Page 2). The Office Action, however, contended that an Official Notice could be taken on using fiber for connecting optical components because it would purportedly be obvious to a person of ordinary skill in the art to include fibers for connecting the outputs of the interferometers and the dual detectors in the optical transmission system of Chew.

Applicant respectfully traverses this conclusion.

As noted in MPEP §2144.03

> It would not be appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known... . If applicant adequately traverses the examiner's assertion of official notice, the examiner must provide documentary evidence in the next Office Action if the rejection is to be maintained.

With respect to Claim 13, all arguments for patentability with respect to Claim 1 are repeated and incorporated herein.

The Office Action further rejected Claims 5 and 17 under 35 U.S.C. §103(a) as being unpatentable over Chew and Official Notice, and further in view of Kuri et al. (US Patent Application 2003/0198477, hereinafter Kuri).

Kuri is directed to a technique to simplify electrical processing after photodetection. (Para. 0008). Kuri discloses oscillators of a transmitter and a receiver, each having a different frequency.

Common sense would not lead one of ordinary skill in the field of high-speed optical communication systems to combine Kuri with Chew. First, Kuri and Chew are each directed to different applications of optical communications. Kuri discloses a system with an optical transmission rate of 155.52 Mb/s (Para. 0031), and which aims to increases signal reception sensitivity and reduce the effects of wavelength dispersion of the optical fiber. (Para. 0008).

On the other hand, the specific teaching of Chew is to provide "a high data rate optical communication system that approaches the theoretical performance limit" (Column 2, Lines 53-56) and is for use in "ultra-high-speed 100 Gb/s-class all-optical networks." (Column 1, Lines 9-12).

A hypothetical combination of Chew and Kuri would result in a drastic reduction of the high-transfer speed as disclosed in Chew, and would hinder the goal of approaching the theoretical performance limit.

Applicant submits that any combination of references that must be modified beyond their express functions is suggestive of an unintended use of hindsight that may have been utilized to drive the present rejection. This is particularly true for an examiner who is attempting to provide a diligent effort that only patentable subject matter occurs. The KSR Guidelines do not justify such an approach. There is still a requirement for the Examiner to step back from the zeal of the

examination process and to appreciate that a Patent Examiner has to wear both hats of advocating a position relative to the prior art while at the same time objectively rendering in a judge-like manner a decision on the patentability of the present claims.

As set forth in MPEP 2142,

> To reach a proper determination under 35 U.S.C. §103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

Secondly, Kuri teaches away from Chew. Kuri states "an optical detector…has a low receiver sensitivity and relatively high noise index, so there is no need to use [optical detectors]." (Para. 0032). On the other hand, Chew requires dual photodetectors 124 in the receiver 102. One of ordinary skill in the art of optical communication systems would not utilize Chew's receiver with photodetectors in the communication system of Kuri which calls for a receiver with no photodetectors.

Accordingly, it is respectfully submitted that Kuri teaches away from the use of photodetectors in the receiver as disclosed in Chew.

> "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley,* 27 F.3d 551, 553 (Fed. Cir. 1994); *see KSR,* 127 S. Ct. at 1739-40 (explaining that when the

> prior art teaches away from a combination, that combination is more likely to be nonobvious). Additionally, a reference may teach away from a use when that use would render the result inoperable. *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1354 (Fed. Cir. 2001).
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> *In re Icon Health and Fitness, Inc.* 2007 U.S. App. Lexis 18244, *10

Claims 8-12 and 20-24 have been cancelled.

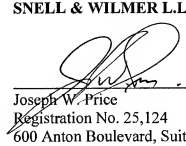
Claims 2-7 depend from Claim 1. Claims 14-19 depend from Claim 13. The dependent claims add features that more particularly define the invention and further distinguish over the cited references and prior art of record.

In view of the amendment to the present claims, it is believed that the case is now in condition for allowance and an early notification of the same is requested.

If the Examiner believes that a telephone interview will help in the prosecution of this matter, the undersigned attorney can be contacted at the listed phone number.

Very truly yours,

SNELL & WILMER L.L.P.



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